

# WISCONSIN CONSTRUCTION SPECIFICATION

## 10. FENCES

### 1. SCOPE

The work shall consist of furnishing and installing fences, including gates and fittings as required on the construction drawings.

### 2. MATERIALS

#### A. Wire gauge

When the size of steel wire is designated by gauge number, the diameter shall be as defined for U.S. Steel Wire Gauge.

#### B. Fencing

- 1) Barbed wire shall conform to the requirements of ASTM A 121, Metallic-Coated Carbon Steel Barbed Wire. Barbed wire shall be composed of two main strands of number 12-½ gauge wire with 14 gauge barbs. If four-point barbed wire is specified, barbs shall be spaced on approximately 5-inch centers. If two-point barbed wire is specified, barbs shall be spaced on approximately 4-inch centers. The wire shall be Class 3 zinc coated as stated in ASTM A 641, Zinc-Coated (Galvanized) Carbon Steel Wire.
- 2) Woven wire shall conform to the requirements of ASTM A 116, Metallic-Coated, Steel Woven Wire Fence Fabric. Top and bottom strands of woven wire shall be a minimum of 11 gauge. Wire for intermediate strands shall be 14-½ gauge or heavier. The wire shall be Class 3 zinc coated, ASTM A 641.
- 3) Poultry fence or netting shall conform to the requirements of ASTM A 390, Zinc-Coated (Galvanized) Steel Poultry Fence Fabric (Hexagonal and Straight Line).
- 4) High-tensile wire shall conform to the requirements of ASTM A 854, Metallic-Coated Steel Smooth High-Tensile Fence and Trellis Wire. High-tensile wire shall be 12-½ gauge wire with a tensile strength of 200,000 pounds per square inch.
- 5) Smooth electric fence wire shall conform to the requirements of ASTM A 641. The wire shall be 12-½ gauge wire with a minimum tensile strength of 180,000 pounds per square inch.

#### C. Stays, fasteners, and tension wire

Stays and fasteners shall conform to the requirements of the appropriate ASTM for the fencing material specified unless otherwise specified. Tension wires shall have a tensile

strength not less than 58,000 pounds per square inch. Stays, fasteners and tension wire shall have Class 3 zinc coating as specified in ASTM A 641.

D. Wood fence posts and braces

Unless otherwise specified, wood posts shall be of black locust, red cedar, osage orange (Bois d'Arc), redwood, pressure treated pine, or other wood of equal life and strength. At least half the diameter or diagonal dimension of red cedar or redwood posts shall be in heartwood. Pressure treatment shall conform to Wisconsin Construction Specification 14, Timber Fabrication and Installation. The posts shall be sound, new, free from decay, with all limbs trimmed substantially flush with the body. All posts shall be substantially straight throughout their full length.

Wood braces shall be of wood material equal to or better than construction grade Douglas Fir. Wood braces shall be pressure treated in conformance with Wisconsin Construction Specification 14, Timber Fabrication and Installation.

E. Steel fence posts and braces

Steel fence posts shall conform to the requirements of ASTM A 702, Steel Fence Posts and Assemblies, Hot Wrought. Posts with punched tabs for fastening the wires shall not be installed. Steel line posts shall weigh not less than 1.33 pounds per foot and shall have a steel anchor plate securely fastened to the plate. The posts shall be "T", "U", or "Y" shaped and have corrugations, knobs, studs, or grooves suitable for fastening fencing to the posts. Steel posts shall be rolled from high carbon steel and shall have a protective coating; either galvanized by the hot dip process, painted with one or more coats of high grade weather resistant paint for steel, or enameled and baked.

Bracing pipes shall conform to the requirements of ASTM A 53, Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

F. Concrete fence posts

Concrete fence posts shall be manufactured to the specified requirements of size, shape, and strength specified in the construction drawings.

G. Panel gates

Panel gates shall be the types, sizes, and quality specified in the construction drawings and shall include the necessary fittings required for installation. The fittings shall consist of not less than two hinges and one latch or galvanized chain for fastening. Latches shall be of such design that a padlock may be used for locking. All fittings shall not be of lesser quality than the gate manufacturer's standard.

#### H. Wire gates

Wire gates shall be the type shown on the drawings, constructed at the locations, and to the dimensions shown on the drawings. The material shall conform to the kinds, grades, and sizes specified for new fence, and shall include the necessary fittings and stays.

#### I. Staples

Staples required to secure the fence wire to wood posts shall be 9 gauge galvanized wire with a minimum length of 1.5 inches for soft woods and a minimum length of 1 inch for close-grain hardwoods.

#### J. Galvanizing

All iron and steel fencing material, except as otherwise specified, shall conform to the requirements of ASTM A 123, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. Clips, bolts, and other small hardware may be protected by electro-deposited zinc or cadmium coating conforming to the requirements of ASTM B 766, Electro-deposited Coatings of Cadmium, coating thickness Class 5, Type III, or ASTM B 633, Electro-deposited Coatings of Zinc or Iron and Steel, Service Condition SC-3, unless otherwise specified.

#### K. Electric Components

- 1) Energizers shall be high voltage/low impedance, short pulse which can produce at least 5000 volts output with all livestock containment fences charged (on) when under maximum anticipated load. Energizers shall be equipped with one digital read-out volt meter, a lightning arrester or lightning choke, and a surge protector. Grounding shall be according to manufacturer's directions and specifications, which includes a ground rod installed at the electrical circuit breaker box.
- 2) Insulators shall be high density polyethylene with ultra-violet stabilizer or porcelain that withstands 10,000 volts or more current leakage.
- 3) Insulated cable for underground burial shall be galvanized wire with two layers of insulation. The insulation must be high density polyethylene with ultra-violet stabilizer.

#### L. Chain Link Fence Materials

- 1) Galvanized
  - a. Chain link fence fabric shall conform to the requirements of ASTM A 392, Zinc-Coated Steel Chain-Link Fence Fabric, 2-inch mesh and 9 gauge galvanized steel wire. Zinc coating shall be Class 2.
  - b. Posts and fence framework shall conform to the requirements of ASTM F 1043, Strength and Protective Coatings on Metal Industrial Chain Link Fence, Group

1A, for Heavy Industrial Fence. Coatings shall be a Type A galvanized coating for internal and external surfaces. Steel pipe posts shall conform to the requirements of ASTM F 1043 and F 1083, Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures. The minimum diameter of end, corner, and pull posts shall be 2-3/8 inches. Line posts shall be at least 1.9 inches in diameter. Gate posts shall have a minimum diameter of 2-7/8 inches.

- c. Fence fittings shall conform to the requirements of ASTM F 626, Fence Fittings. Fittings shall be galvanized steel. Wire ties and clips shall be 9 gauge.
- d. Gates, gateposts, and gate accessories shall conform to the requirements of ASTM F 900, Industrial and Commercial Swing Gates. Coating shall be the same as selected for adjoining fence and framework.
- e. Barbed wire shall be 12-½ gauge and shall conform to the requirements of ASTM A 121, and be chain link fence grade.

## 2) Galvanized and PVC coated

- a. Chain link fence fabric shall conform to the requirements of ASTM F 668, Poly (Vinyl Chloride) (PVC) and other Organic Polymer-Coated Steel Chain-Link Fence Fabric, for Class 2a or 2b, 2-inch mesh, and 9 gauge galvanized steel wire. The fabric shall have a polymer top coating of the color specified in the drawings.
- b. Posts and fence framework shall conform to the requirements of ASTM F 1043 Group 1A, for Heavy Industrial Fence. Coatings shall be a Type A galvanized coating for internal and external surfaces and covered with a polymer top coating of color as specified in the drawings.
- c. Fence fittings shall conform to the requirements of ASTM F 626. Fittings shall be galvanized steel with a polymer top coating of color as specified in the drawings.
- d. Any damage to the coating shall be repaired in accordance with the manufacturer's recommendations, or the damaged fencing material shall be replaced. The contractor shall provide the engineer or technician a copy of the manufacturer's recommended repair procedure and materials before correcting damaged coatings.

## 3. SETTING POSTS

Concrete or wood posts shall be set in holes and backfilled with earth except where otherwise specified. Wood posts may be driven if the driving process does not damage the integrity of the post. Steel posts shall be driven unless otherwise specified.

Holes for installing fence posts shall be at least 6 inches larger than the diameter or side dimension of the posts.

Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the posthole up to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than 12 inches and shall completely fill the posthole to the surface of the ground. All chain link fence posts shall be set in concrete backfill. Backfill, either earth or concrete, shall be crowned-up around posts at the ground surface.

No stress shall be applied to posts set in concrete for a period of not less than 24 hours following the development of a firm set of the concrete. Chain link fence fabric shall not be stretched until at least 4 days after the posts are set in concrete backfill or grouted in concrete walls. Concrete shall completely fill the annular space around the posts and shall be neatly finished to slope up to the post approximately 1-½ inches above the ground surface. Pull posts shall be located in long straight runs of fence at intervals of 500 feet or less. Posts set in concrete walls shall be grouted into preformed holes at least 12 inches in depth.

#### 4. CORNER ASSEMBLY

Corner assemblies shall be installed at all points where the fence alignment changes 15 degrees or more. High-tensile wire fence corners shall have a double assembly consisting of three driven posts with horizontal braces. Each assembly shall be further braced with a double wrap of high tensile wire.

#### 5. END PANELS

End panels shall be built at gates and fence ends. High-tensile wire fences shall have a double assembly consisting of three driven posts with horizontal braces. Each assembly shall be further braced with a double wrap of high tensile wire.

#### 6. PULL POST ASSEMBLY

Pull post assembly (bracing within a section of straight fence) shall be installed at the following locations:

- A. In straight fence sections, at intervals not to exceed 660 feet.
- B. At any point where the vertical angle described by two adjacent reaches of wire is upward of and exceeds 10 degrees.
- C. At the beginning and end of each curved fence section.
- D. When used with chain link fences, braces and top rails shall be installed horizontally at the height shown on the drawings or recommended by the manufacturer. Braces and top rails shall be attached to the posts by suitable fittings, as recommended by the manufacturer. When the brace has been placed, a 6 gauge double truss galvanized steel wire with adjustable tightener and fittings shall be attached to the corner post just below the brace and to the brace post approximately 4 inches above ground level. A similar truss wire shall be attached to the brace post just below the brace and to the corner post approximately 4 inches above ground level. A 7 gauge galvanized steel

tension wire, tightened by mechanical means, shall be placed approximately 4 inches from the ground level. A similar tension wire shall be placed at the top of the fence if a top rail is not used.

- E. High-tensile wire fences shall have a double assembly consisting of three driven posts with horizontal braces. Each assembly shall be further braced with a double wrap of high tensile wire.

## 7. ATTACHING FENCING TO POSTS

The fencing shall be stretched and attached to posts as follows:

- A. The fencing wire or netting shall be placed on the side of the post opposite the area being protected except for installation along curved sections.
- B. The fencing wire or netting shall be placed on the outside for installation along curved sections.
- C. The fencing wire or netting shall be fastened to each end post, corner post, and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three tightly wound wraps.
- D. The fencing wire or netting shall be fastened to wooden line posts by means of steel staples. Woven-wire fencing shall be attached at alternate horizontal strands. Each strand of barbed wire shall be attached to each post. Steel staples shall be driven diagonally with the grain of wood and at a slight downward angle and shall not be driven so tightly as to bind the wire against the post.
- E. The fencing wire or netting shall be fastened to steel or concrete line posts with either two turns of 14 gauge galvanized steel or iron wire or in accordance with recommendations provided by the post's manufacturer.
- F. Wire shall be spliced by means of a Western Union splice or by suitable splice sleeves applied with a tool designed for that purpose. The Western Union splice shall have no less than eight wraps of each end about the other. All wraps shall be tightly wound and closely spaced. Splices made with splice sleeves shall have a tensile strength no less than 80 percent of the strength of the wire being spliced.
- G. A stretcher bar of the same length as the chain link fence fabric width shall secure each end of each run of fabric. The bar and fabric shall be stretched taut and secured to the terminal post by hook bolts equally spaced not more than 15 inches apart. The fabric shall be attached to all braces, the top rail, all line posts and the tension wire by wire ties or clips at intervals not exceeding two feet.
- H. High-tensile wire shall be strung to a tension of not less than 250 pounds. The wire shall be fastened on a direct line splice with enough nicopress sleeves that the accumulated strength of the sleeves exceeds the tensile strength of the wire. End wrap splices shall be fastened with two nicopress sleeves. Splices may also be made with other products used as directed by the manufacturer.

## 8. STAYS

Stays shall be attached to the fencing as needed or at the spacing shown on the drawings to ensure maintenance of the proper spacing of the fence wire strands.

## 9. CROSSINGS AT DEPRESSIONS AND WATERCOURSES

Where fencing is installed parallel to the ground surface, the line posts subject to upward pull shall be anchored.

If the fence wire or netting is installed parallel to the ground surface, the line posts subject to uplift shall be anchored by means of extra embedment or by special anchors as detailed on the drawings.

If the fence wire is installed with the top wire straight and parallel to the ground surface on either side of the depression, extra length posts shall be used to allow normal post embedment. Unless otherwise specified, excess space between the bottom of the fence and the ground shall be closed with extra strands of barbed wire or with netting.